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Ethnicity, Migration Status and Dental Caries Experience among Adults in East London

Elsa K. DELGADO-ANGULO;[1,2] **Wagner MARCENES**;[1] **Seeromanie HARDING**;[3] **Eduardo BERNABÉ**[1]

[1] Division of Population and Patient Health, King's College London Dental Institute at Guy's, King's College and St. Thomas' Hospitals, London, United Kingdom

[2] Departamento Académico de Odontología Social, Universidad Peruana Cayetano Heredia, Lima, Perú

[3] Schools of Life Course Sciences & Population Health and Environmental Sciences, Faculty of Life Sciences & Medicine, King's College London, London, United Kingdom

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Corresponding Author:
Dr Eduardo Bernabé,
Division of Population and Patient Health
King's College London Dental Institute
Denmark Hill Campus
Bessemer Road, London SE5 9RS, United Kingdom
Tel: +44 (0) 20 3299 3022
Email: eduardo.bernabe@kcl.ac.uk

ABSTRACT

Objective: To assess the interrelationship between ethnicity, migration status and dental caries experience among adults in East London.

Methods: We analysed data from 1910 adults (16-65 years) representing nine ethnic groups, who took part in a community-based health survey in East London. Participants completed a supervised questionnaire and were clinically examined by trained dentists. Dental caries was assessed with the number of decayed, missing and filled teeth (DMFT). The association of ethnicity, nativity status and migration history with DMFT was assessed in negative binomial regression models controlling for demographic, socioeconomic and behavioural factors.

Results: White migrants had greater DMFT than UK-born adults whereas every Asian and Black migrant group had lower DMFT than adults of the same ethnic group born in the UK (albeit significant only for Black Caribbean and Asian Others). Among foreign-born adults, age at arrival (Rate Ratio: 1.03; 95% Confidence Interval: 1.01-1.05) and length of residence (1.04; 95%CI: 1.02-1.06) were positively associated with DMFT. A significant interaction between both factors was also found, with more pronounced differences between older and younger migrants at longer stay in the UK for White Others, Black Caribbean and Asian Others.

Conclusion: Large inequalities in caries experience were found between foreign- and UK-born adults, with considerable variation across ethnic groups. Looking beyond cultural explanations, in favour of social and environmental factors, may help explain those inequalities.

Key words: human migration, ethnic groups, socioeconomic factors, dental caries.

INTRODUCTION

Most theories of migrant health have focused on acculturation, a concept that refers to the acquisition of behaviours, attitudes and values from the receiving society.[1-3] In recent years, there has been a call for better integration of migrant health research into social epidemiology to emphasise the role of social and structural explanations.[4,5] This shift has been supported by two theoretical developments. The first is the use of intersectionality theory to understand how migrant status interacts with other social determinants of health over the life course to engender health inequalities.[6,7] The second is the use of a cross-national perspective to identify factors in sending and receiving countries that affect migrant health.[4,8] Such factors may act differently depending on health outcomes, critical periods of exposure and age at arrival.[8]

Migration patterns in the UK have changed tremendously in the last two decades with ease of global travel, asylum seeking from conflict areas, accession countries, etc.[9] The route of entry to the receiving country is important as migrants from countries where formal access requirements are not necessary, as with Irish people in England, tend to show poorer health than the host population.[10] The lack of, or reduced, border control might induce migration of groups with socioeconomic and health disadvantages.[11,12] Contrarily, migrants from countries where there are strict controls tend to be more selective on the basis of health and socioeconomic background.[5] For instance, we would expect Eastern Europeans to have poorer health than natives as their entry via right of access (European Union membership) does not impose a health barrier when migrating to the UK. A better understanding of the environment and experiences that migrants face before, during and after migration is paramount to inform programmes that protect the health of migrants and their families.

The oral health of migrants remains largely unexplored in the UK. Prior research in other countries have yielded contradicting findings.[13] An early US study showed that the length of residence was positively associated with higher caries experience among Haitian migrants[14] while another US study among eight migrant groups, one of which was Haitians, found no association.[15] Moreover, age at arrival was positively associated with higher caries experience in one of those studies[15] but not associated in the other.[14] The proportion of life in the host county was not associated with caries experience among Vietnamese in Australia either.[16] No study has looked at age at arrival and length of residence simultaneously or their potential interaction. On the other hand, two recent longitudinal studies have shown that dental status of recent migrants to Canada[17] and Israel[18] deteriorated 4-5 years post-migration, but were still lower than those seen in the host population. This study explored the interrelationship between

ethnicity, migration status and caries experience among adults in East London. We hypothesised that there are clear inequalities in dental status between native and migrant adults, with considerable variations across ethnic groups. We also hypothesised that caries experience differs according to age at arrival and length of residence in the UK, with older and long-term migrants showing higher caries experience than their younger and recent counterparts.

METHODS

Study population

We analysed data from the East London Oral Health Inequality (ELOHI) Study, which included adults 16 to 65 years old living in Waltham Forest, Redbridge and Barking and Dagenham in 2009-2010. This mixed-methods study has been carried out in an ethnically diverse and socially deprived area of London aiming to further understand oral health disparities; particularly the barriers, facilitators and pathways between neighbourhood deprivation, dental behaviours and oral health status. The Outer North-East London Research Ethics Committee approved the study protocol (08/H0701/93).[19,20]

Phase 1 of the ELOHI study adopted a cross-sectional study design. A multi-stage stratified random sampling approach was used to select a representative sample of the ethnically-diverse general non-institutionalised population in Outer North-East London. The sampling frame was a list of all addresses stratified by the number of wards in Barking and Dagenham (n=17), Redbridge (n=21) and Waltham Forest (n=20). Fifty-five addresses were randomly selected from each ward to yield 3,193 addresses. Residents were then contacted by post and invited to participate in the study. We excluded 457 commercial premises or vacant addresses and 208 ineligible households with no residing adults age 16 to 65 years. The final sampling frame included 2,528 valid addresses and 1,437 households agreed to participate in the study. The household response rates in Barking and Dagenham, Redbridge and Waltham Forest were 61%, 52.2% and 61.2% respectively, which represented a total response rate of 57%. A maximum of two adults per household were invited to participate, and all agreed yielding a sample of 2,343 adults who participated in at least one part of the survey.[19,20]

Data collection

Data were collected via oral examinations and supervised questionnaires in participants' homes. Trained dentists inspected all participants' teeth, including wisdom teeth, with the help of mouth mirrors, periodontal probes and artificial light. The clinical diagnostic criteria of the

UK Adult Dental Health Survey (caries into dentine) were used.[21] To check reliability, the reference examiner repeated clinical examinations on 133 participants, within two weeks of the first examination. Inter-examiner reliability for dental condition at tooth-level was good (Kappa=0.83, range: 0.77-0.99). Intra-examiner reliability was not assessed. Dental caries experience was the outcome measure for this study, which was the sum of decayed, missing and filled permanent teeth (DMFT index).

The supervised questionnaire gathered information on participants' demographic factors, socioeconomic position (SEP), migration status and dental behaviours. Ethnicity was self-assigned using an adaptation of the UK Census 2001 categories; including 26 ethnic sub-groups organised in five main groups (White, Asian, Black, Mixed and Other). Education and the National Statistics Socio-Economic Classification (NS-SEC) were the SEP indicators. Education was measured as participants' highest qualification (no qualifications, secondary school, A levels, university degree or above). Five NS-SEC groups were derived using the self-coded method based on current or last main job or occupation, employment status, size of organisation and supervisory status. For complete coverage of the population, full-time students, individuals who had never worked or were in long-term unemployment were added as never/un-employed.[22] Migration status was derived from responses to two questions. The first asked participants to indicate their country of birth (nativity status). Participants were then classified as UK-born or foreign-born. The latter category included any type of migrants (work, study, family, asylum seeker/refugee and illegal) as no information on route of entry to the country was collected as part of the survey. Those born abroad were then asked their age at arrival. This information was subtracted from the age at the time of the survey to calculate the time lived in the UK (length of residence). Last dental visit ($\leq$1 year ago versus >1 year ago), toothbrushing frequency ($\leq$1/day versus $\geq$2/day) and sugars intake frequency were the dental behaviours evaluated. Intake of 6 sugary items (chocolate, biscuits, cakes, confectionary, soft drinks and fruit juice) was reported using 7-point scales. Each sugary item was scored as follows: >1/day (2), 1/day (1), most days (4/7=0.57), 1/week (1/7=0.14), 1/month (1/30=0.03), <1/month (0) and never (0). Weighted scores (in brackets) matched the lower frequency of consumption for each option.[23] Scores for the 6 items were aggregated to produce a total score, which ranged from 0 to 12. Based on this total score, sugars intake frequency was classified as $\leq$2/day versus >2/day.[19,20]

Statistical analysis

Data were weighted to adjust for the unequal probability of selection and non-response as well as to produce a representative sample (with respect to age, gender and ethnicity) based on the UK Census 2001. All analyses incorporated data weighting and survey features (stratification and clustering) to produce corrected confidence intervals. They were conducted in Stata Statistical Software (Release 14, College Station, TX: StataCorp LP).

We first compared the sociodemographic composition of UK- and foreign-born adults with the Chi-square test. Thereafter, we modelled the association of ethnicity, nativity status and migration history with caries experience using negative binomial regression as the latter was an over-dispersed count measure. Rate ratios (RR) were therefore reported as the measure of association. In line with the intersectionality theory,[6,7] we treated ethnicity and nativity status as same-level determinants of dental status and then evaluated the role of SEP and behaviours on these associations. Our modelling strategy was first to estimate the crude association of ethnicity and nativity status with DMFT (Model 1A) in the full sample, and gradually adjust them for demographic factors (sex, age, and ethnicity or nativity status) in Model 1B, SEP measures (education and NS-SEC) in Model 1C, and dental behaviours (last dental visit, toothbrushing frequency and sugars intake frequency) in Model 1D. The moderating role of nativity status, education and NS-SEC in the association between ethnicity and DMFT was examined by testing the significance of their corresponding two-way interaction with ethnicity when added to Model 1D one at a time. To examine the direction and magnitude of the significant interactions, we computed adjusted predictions (predictive margins) for DMFT from the regression model including all main effects and the significant interaction.

The association of migration status with DMFT was assessed in the subsample of foreign-born adults. We used the same modelling strategy as described above, starting with the crude associations of ethnicity, age at arrival and length of residence with DMFT (Model 2A), and gradually adjusting them for demographic (Model 2B), SEP (Model 2C) and behavioural factors (Model 2D). We then tested the two- and three-way interactions among ethnicity, age at arrival and length of residence by adding each term one at a time to Model 2D. To ease interpretation, we reported adjusted predictions for DMFT at two different points in the distribution of age at arrival (1SD below and above the mean for younger and older migrants) and length of residence (1SD below and above the mean for recent and long-term migrants) for each ethnic group. As there is a mathematical relationship between age, age at arrival and length of residence, we dealt with potential collinearity by treating age as categorical (10-year

brackets) and the other measures as continuous variables. Similar results were obtained when excluding age from all regression models in sensitivity analysis.

RESULTS

For this analysis, we excluded 67 participants who were from Mixed/Other ethnicity due to their small numbers. We also excluded participants with missing data on covariates (education=169, NS-SEC=88, migration status=55, sugars intake=27, toothbrushing frequency=18, last dental visit=10 and nativity status=5). There were no major differences between participants excluded and those in the study sample. Therefore, the study sample included 1910 adults (874 UK-born and 1036 foreign-born) from nine ethnic groups, which was a close representation of London's population (Table S1). The composition of UK- and foreign-born groups is shown in Table S2. White Others (including Eastern, Western, Mediterranean and Other Europeans), Asian Others (including mainly Asian British, Chinese and Other Asians) and Pakistanis were the largest minority ethnic groups in the sample. Among foreign-born adults, the mean age at arrival and length of residence were 23.1 (SD: 12.5, range: 0-64) and 13.6 (SD: 14.6, range: 0-53) years, respectively.

Ethnicity and nativity status were associated with DMFT in unadjusted models (Table 1). White Others had higher while Black and Asian ethnic groups had lower DMFT than White British adults. In addition, foreign-born had lower DMFT than UK-born adults. Ethnic differences in DMFT remained significant after adjustments for SEP measures and dental behaviours. The association between nativity status and DMFT was fully attenuated when controlling for SEP measures and remained unchanged after subsequent adjustment for dental behaviours. The two-way interactions of ethnicity and nativity status with each SEP measure were not significant (all $p>0.05$). Only the interaction between ethnicity and nativity status was significant ($p<0.001$) when added to Model 1D. White British (albeit not significant) and White Other born abroad had higher DMFT than UK-born adults. On the contrary, UK-born adults had higher DMFT than foreign-born among all other ethnic groups, with significant differences by nativity status found among Black Caribbean and Asian Others (Table 2).

We subsequently explored the association of migration status with DMFT among foreign-born adults (Table 3). Age at arrival and length of residence were significantly associated with DMFT. These associations persisted after adjustments for SEP measures and dental behaviours. The greater the age at arrival and the longer the residence in the UK the greater the DMFT (adjusted RR: 1.03 and 1.04 per additional year, Model 2D). The three-way interaction

between ethnicity, age at arrival and length of residence was significant (p=0.002). Figure 1 shows higher DMFT in older than younger migrants (1SD above and below the mean age at arrival, respectively) and in long-term than recent migrants (1SD above and below the mean length of residence) among all ethnic groups. However, the synergistic effect of age at arrival and length of residence on DMFT differed by ethnic groups. It was only significant among White Other, Black Caribbean and Asian Others.

DISCUSSION

This study shows foreign-born have different caries experience than native-born adults, with marked variations by ethnicity. White migrants had greater caries experience than native-born adults of the same ethnicity. Contrarily, every Asian and Black migrant group had lower caries experience than UK-born adults of the same ethnicity. Moreover, all native-born Asian and Black adults had lower caries experience than White British. The present findings challenge two strongly held views in migrant health research. On one hand, our findings demonstrate that the 'healthy migrant' experience does not apply to dental health across all ethnic groups. This was particularly true for White Others (mainly Eastern Europeans). Geographical and political access means that Europeans do not face a health barrier to migration as migrants from other world regions, thus increasing the likelihood that worse-off individuals migrate if an opportunity arises. The findings also imply that migrants' dental status reflect that of their area of origin. Global data shows that the prevalence of untreated caries was higher in Eastern Europe and lower in Africa and South Asia compared to the prevalence in the UK.[24]

On the other hand, cultural explanations (acculturation) have dominated migrant health research till very recently. Our findings show that dental behaviours, which are strongly associated with caries increment,[25] did not help explaining differences in caries experience between foreign- and native-born adults. It thus follows that other factors pushing and pulling people into migration may be more relevant to explain those inequalities. Although we measured participants' SEP in the receiving country, SEP in sending countries is equally important as it affects migrants' health over the life course (before, during and after migration).[8] There is also some evidence that experiences of discrimination[26] and psychosocial stress[27-29] as well as community characteristics[30] may underlie ethnic inequalities in oral health. Given that ethnicity and migration are different but connected social categories, it is possible that these experiences influence migrants' health too.

Further analysis among foreign-born adults showed that the association between migration status and caries experience could be mediated by age at arrival and length of residence. We argue that the social and structural environment to which foreign-born adults have been exposed to during their time in the UK worsened their dental status. As younger migrants (1SD below the mean=10.6 years) come with their parents, they are raised in a protective environment. A network of the same ethnicity is likely to act as a buffer against negative or stressful experiences, a phenomenon called ethnic density effects.[31] On the contrary, older migrants (1SD above the mean=35.6 years) generally come alone, even if married, and must live on their own. As such, they would spend more time outdoors, and in contact with British socioeconomic and environmental factors. However, it cannot be assumed that the synergistic effect between age at arrival and length of residence be the same across all ethnic groups. Differences between older and younger migrants were more pronounced with a longer stay in the UK, especially for White Others, Black Caribbean and Asian Others.

Previous UK studies on ethnic inequalities in oral health have focused on differences in socioeconomic conditions between ethnic groups.[19,20,32] This study shows that other factors, beyond cultural explanations, play a role in caries experience among migrants. It also shows that the caries burden is found among White rather than Black or Asian migrants. A detail evaluation of the determinants of oral health of migrants in the UK is paramount to understand and respond to their specific oral health needs. We also need further research to unravel the factors that influence migrants' health in sending and receiving countries, which could later inform oral health policies for migrants. Of note is the fact that no differences by nativity status or migration history were found in certain ethnic groups, such as Black Africans. Further studies could explore the characteristics that make these ethnic groups so homogenous.

Some study limitations must be addressed. First, this was a cross-sectional descriptive study which limits the interpretation of the associations. This is especially relevant given the cumulative nature of the DMFT index, which does not capture information on when treatment for dental caries was received (either before or after migration). Despite its limitations, the DMFT is the most commonly used epidemiological index in dentistry. Second, our study sample included 84% of the White, Black and Asian adults (the main three ethnic groups in the UK) who participated in the ELOHI study. However, we found no socio-demographic differences between those with and without missing data on covariates, suggesting that exclusions might not have affected the study findings and that they are still generalisable. Third, age at arrival and length of residence are only two of many measures of migration status.

They are considered mere proxies as they do not directly measure the experience of migration.[2] However, these measures are commonly used, particularly in new settings where validated instruments are not available.[3,33]

To conclude, large inequalities in dental caries experience were found between foreign- and native-born adults in East London, with better dental status for Black and Asian migrants as well as for White native-born than for their counterparts of the same ethnic group. The greatest caries experience was found among older migrants with long-term residence in the UK. The synergistic effect between age at arrival and length of residence differed by ethnicity.

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LIST OF TABLES AND FIGURES

Table 1. Regression models for the association of ethnicity and nativity status with caries experience among adults in East London (n=1910)

	DMFT		Model 1A[a]		Model 1B[a]		Model 1C[a]		Model 1D[a]	
	Mean	**[95% CI]**	**RR[b]**	**[95% CI]**	**RR[b]**	**[95% CI]**	**RR[b]**	**[95% CI]**	**RR[b]**	**[95% CI]**
Ethnicity										
White British	13.4	[12.4-14.3]	1.00	[Reference]	1.00	[Reference]	1.00	[Reference]	1.00	[Reference]
White Others	14.0	[12.6-15.4]	1.05	[0.93-1.19]	1.23	[1.06-1.41]**	1.25	[1.09-1.43]**	1.22	[1.07-1.40]**
Black African	4.9	[4.3-5.5]	0.37	[0.32-0.42]***	0.48	[0.40-0.57]***	0.48	[0.41-0.57]***	0.50	[0.42-0.59]***
Black Caribbean	8.4	[6.4-10.5]	0.63	[0.49-0.82]***	0.68	[0.56-0.83]***	0.69	[0.57-0.84]***	0.68	[0.56-0.83]***
Black Other	8.5	[6.8-10.3]	0.64	[0.52-0.79]***	0.67	[0.57-0.80]***	0.68	[0.58-0.81]***	0.69	[0.58-0.82]***
Pakistani	5.5	[4.5-6.6]	0.41	[0.34-0.51]***	0.51	[0.41-0.63]***	0.52	[0.42-0.63]***	0.51	[0.43-0.62]***
Indian	7.4	[6.1-8.8]	0.56	[0.46-0.68]***	0.58	[0.47-0.72]***	0.59	[0.48-0.72]***	0.61	[0.50-0.75]***
Bangladeshi	6.4	[5.4-7.4]	0.48	[0.40-0.57]***	0.57	[0.47-0.70]***	0.58	[0.47-0.71]***	0.58	[0.47-0.72]***
Asian Other	8.1	[7.3-9.0]	0.61	[0.54-0.69]***	0.71	[0.62-0.81]***	0.72	[0.63-0.82]***	0.72	[0.64-0.82]***
Nativity status										
UK-born	12.6	[11.8-13.4]	1.00	[Reference]	1.00	[Reference]	1.00	[Reference]	1.00	[Reference]
Foreign-born	9.8	[9.0-10.6]	0.77	[0.70-0.86]***	0.99	[0.89-1.11]	0.99	[0.88-1.10]	0.99	[0.88-1.10]
Education										
None	13.2	[10.7-15.6]	1.00	[Reference]			1.00	[Reference]	1.00	[Reference]
Secondary school	12.7	[11.7-13.8]	0.97	[0.79-1.18]			1.06	[0.92-1.21]	1.03	[0.90-1.18]
A levels	11.4	[10.2-12.6]	0.86	[0.70-1.07]			0.95	[0.81-1.12]	0.92	[0.79-1.07]
Degree or above	10.3	[9.5-11.1]	0.78	[0.64-0.96]*			0.94	[0.82-1.08]	0.93	[0.81-1.05]
NS-SEC										
Managerial/professional	11.9	[11.1-12.7]	1.00	[Reference]			1.00	[Reference]	1.00	[Reference]
Intermediate	13.2	[11.8-14.5]	1.11	[0.98-1.25]			1.04	[0.95-1.15]	1.05	[0.95-1.15]
Routine/manual	11.7	[10.3-13.2]	0.99	[0.86-1.13]			1.05	[0.93-1.18]	1.05	[0.94-1.18]
Never/un-employed	9.1	[8.1-10.1]	0.76	[0.67-0.87]***			1.08	[0.95-1.24]	1.08	[0.95-1.22]

[a] Model 1A was unadjusted; Model 1B was adjusted for sex, age groups and the other variable in the table; Model 1C was additionally adjusted for education and socioeconomic classification; and Model 1D was also adjusted for last dental visit, toothbrushing frequency and sugars intake frequency

[b] Negative binomial regression was fitted and rate ratios (RR) reported

* $p<0.05$; ** $p<0.01$; *** $p<0.001$

NS-SEC: National Statistics Socio-Economic Classification

Table 2. Dental caries experience according to ethnicity and nativity status (n=1910)

Ethnicity	UK-born		Foreign-born		Mean difference[a] [95% CI]	
	Mean[a]	[95% CI]	Mean[a]	[95% CI]		
White British	11.6	[10.8-12.5]	14.8	[10.3-19.4]	3.2	[-1.4 to 7.8]
White Others	11.2	[9.7-12.7]	14.6	[13.4-15.7]	3.4	[1.5 to 5.3]
Black African	5.9	[4.3-7.6]	5.8	[5.0-6.6]	-0.1	[-1.9 to 1.7]
Black Caribbean	10.3	[7.7-13.0]	7.2	[5.8-8.6]	-3.2	[-6.2 to -0.1]
Black Other	9.2	[7.8-10.5]	7.0	[5.1-8.9]	-2.2	[-4.5 to 0.2]
Pakistani	7.0	[4.6-9.3]	5.8	[4.8-6.8]	-1.2	[-3.8 to 1.4]
Indian	7.8	[5.6-9.9]	7.0	[5.6-8.4]	-0.8	[-3.3 to 1.7]
Bangladeshi	8.5	[6.2-10.9]	6.3	[4.8-7.8]	-2.2	[-5.0 to 0.6]
Asian Other	9.4	[8.5-10.4]	7.9	[6.8-9.0]	-1.5	[-3.0 to -0.1]

[a] Adjusted predictions for DMFT derived from negative binomial regression models including ethnicity, nativity status, sex, age, education, NS-SEC, last dental visit, toothbrushing frequency, sugars intake frequency and the two-way interaction between ethnicity and nativity status as explanatory variables.

Table 3. Regression models for the association of ethnicity, age at arrival and length of residence in the UK with dental caries experience among adult migrants in East London (n=1036)

	Model 2A[a]		**Model 2B**[a]		**Model 2C**[a]		**Model 2D**[a]	
	RR[b]	**[95% CI]**	**RR**[b]	**[95% CI]**	**RR**[b]	**[95% CI]**	**RR**[b]	**[95% CI]**
Ethnicity								
White British	1.00	[Reference]	1.00	[Reference]	1.00	[Reference]	1.00	[Reference]
White Others	0.86	[0.64-1.16]	1.02	[0.72-1.43]	1.02	[0.74-1.41]	1.03	[0.73-1.44]
Black African	0.30	[0.22-0.40]***	0.38	[0.26-0.55]***	0.38	[0.27-0.53]***	0.41	[0.28-0.59]***
Black Caribbean	0.46	[0.30-0.70]***	0.48	[0.33-0.71]***	0.49	[0.34-0.72]***	0.51	[0.34-0.74]***
Black Other	0.53	[0.34-0.82]**	0.48	[0.31-0.74]**	0.48	[0.32-0.72]***	0.47	[0.31-0.72]**
Pakistani	0.34	[0.24-0.48]***	0.40	[0.27-0.58]***	0.39	[0.28-0.56]***	0.40	[0.28-0.58]***
Indian	0.46	[0.32-0.66]***	0.47	[0.31-0.69]***	0.46	[0.32-0.67]***	0.51	[0.35-0.74]***
Bangladeshi	0.39	[0.28-0.54]***	0.43	[0.30-0.63]***	0.41	[0.29-0.60]***	0.42	[0.29-0.63]***
Asian Other	0.50	[0.37-0.69]***	0.54	[0.38-0.78]**	0.54	[0.38-0.76]***	0.56	[0.39-0.80]**
Age at arrival	1.01	[1.01-1.02]***	1.03	[1.01-1.05]*	1.03	[1.01-1.05]**	1.03	[1.01-1.05]**
Length of residence	1.01	[1.01-1.02]***	1.03	[1.01-1.05]**	1.03	[1.01-1.05]**	1.04	[1.02-1.06]**
Education								
None	1.00	[Reference]			1.00	[Reference]	1.00	[Reference]
Secondary school	0.85	[0.66-1.09]			1.04	[0.87-1.24]	0.96	[0.81-1.15]
A levels	0.75	[0.58-0.98]*			0.80	[0.69-0.94]**	0.75	[0.64-0.88]***
Degree or above	0.71	[0.56-0.91]**			0.85	[0.72-0.99]*	0.79	[0.67-0.93]**
NS-SEC								
Managerial/professional	1.00	[Reference]			1.00	[Reference]	1.00	[Reference]
Intermediate	1.24	[0.99-1.56]			1.06	[0.89-1.26]	1.05	[0.89-1.23]
Routine/manual	1.12	[0.92-1.37]			1.01	[0.87-1.18]	1.03	[0.89-1.21]
Never/un-employed	0.97	[0.79-1.20]			1.12	[0.97-1.30]	1.16	[0.99-1.35]

[a] Model 2A was unadjusted; Model 2B was adjusted for sex, age groups and the other variable in the table; Model 2C was additionally adjusted for education and socioeconomic classification; and Model 2D was also adjusted for last dental visit, toothbrushing frequency and sugars intake frequency

[b] Negative binomial regression was fitted and rate ratios (RR) reported

* p<0.05; ** p<0.01; *** p<0.001

NS-SEC: National Statistics Socio-Economic Classification

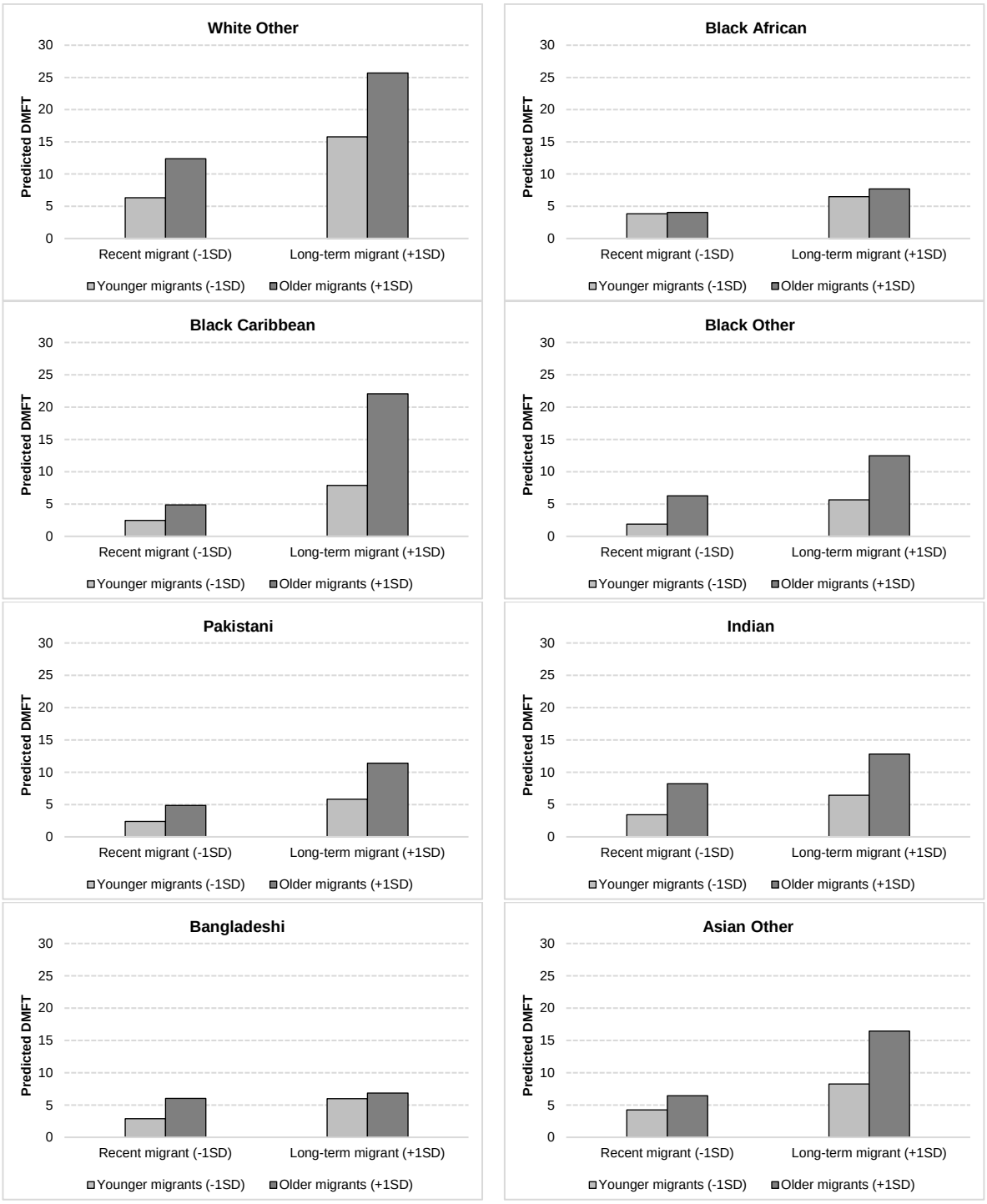

Figure 1. Dental caries experience according to age at arrival and length of residence among foreign-born adults from different ethnic groups (n=1036). Younger and older migrants defined at 1SD below and above the mean age at arrival. Recent and long-term migrants defined at 1SD below and above the mean length of residence. Adjusted predictions for DMFT derived from negative binomial regression models including ethnicity, age at arrival, length of residence, sex, age groups, education, socioeconomic classification, last dental visit, toothbrushing frequency, sugars intake frequency and the three-way interaction between ethnicity, age at arrival, length of residence as explanatory variables.